8.3 Animal behaviour

Animal responses to the environment

Animals show two different types of behaviours:

- **innate behaviours** are those which offspring are born with, and naturally occur – these are genetically determined and encoded within the organism's DNA, where the patterns of behaviour are the same throughout the species
- **learned behaviours** are determined by the genetic makeup of the organism and their interaction with and influences of the environment, these are learned through *conditioning*, *imprinting* and *habituation* and are not passed onto offspring genetically, but may be taught to offspring by learning

Innate behaviour

Innate behaviours are described as being **stereotyped** (always reproduced in the same way) and are the same throughout the entire species. Possessing innate behaviours such as basic life functions (e.g. breathing and feeding), and recognition of danger, and its consequent emotion fear, help an organism to survive, and so play their part in evolutionary theory.

One example of innate behaviour is a **reflex action**. This is a fast, stereotyped response, the most commonly-known example of which is the **escape reflex** common to many invertebrates, such as fish and shrimp, who use the reflex to escape predation. For example, with fish, a change in pressure in their surrounding water produces a reflex action which causes their tails to flick, which darts them away from the area in a certain direction. These are involuntary responses.

The second type of innate behaviour is the **taxis**. Taxes are behaviours which are not immediate like reflexes, but are more gradual (although still innate). Taxes are *directional movement responses*, and can be positive or negative. Examples include that of ants, where **positive chemotaxis** describes the responses in their antennae which direct them to move towards the stimulus chemical. A second example in maggots is **negative phototaxis** which describes the maggots detecting a light stimulus and moving away from it. Likewise, moving towards the light would be positive phototaxis.

The third and final type of simple innate behaviour is **kinesis**. Kineses are *non-directional movement responses*, whereby a particular direction is not indicated, but the response of the organism is to change their direction. This response involves an increase in the rate of movement when an organism is under unfavourable conditions. An example lies within woodlice, who prefer damp and dark conditions to avoid predation, and so when in bright light or in dry areas, they move rapidly and randomly until they reach an area which suits their preferred conditions more appropriately.

A more complex type of innate behaviour is called a **fixed action pattern** (FAP). This is an innate characteristic where behaviours always follow the same set of rules – but this is a set of responses to a non-immediate stimulus. A good example is the **waggle dance** in worker honey bees, whereby a bee can indicate the direction and distance to a food source to the other bees based on the angle and duration of its waggle.

Learned behaviour

Learned behaviour is described as that which shows adaptation in response to experience. This type of behaviour is of greatest survival benefit to animals:

- with a longer lifespan, and so time to learn
- with an element of parental care of the young, which involves learning from parents
- living for a part of the time at least with other members of the species in order to learn from them

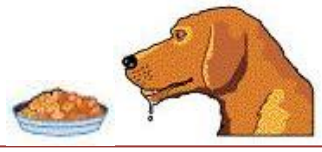
The main advantage of learned behaviour over innate behaviour is that it is adapted in response to changing circumstance or environments. There are six major areas of learned behaviour which you need to know:

Behaviour	Examples
Habituation – animals learn to ignore certain stimuli because they realise after repeated exposure that they offer no positive nor negative effects, allowing animals to not waste energy making escape responses to non-dangerous stimuli	• birds learning to ignore scarecrows as they pose no threat • learning to ignore non-dangerous stimuli in the environment such as waves and wind noises • humans learning to sleep with passing planes and trains

Classical conditioning – building an association between one stimuli and another so that the conditioned stimulus promotes the same response as another, this can be positive or negative	• Pavlov's dogs learning to salivate at the sound of a bell • a cat running to the kitchen whenever it hears the can opener on a tin of cat food
Operant conditioning – learning behaviours through reinforcement and punishment, whereby actions are either rewarded (reinforced) or punished so that animals learn whether or not they should perform those behaviours	• the rats in Skinner's boxes learning to press on a lever to obtain food • humans learning to avoid foods which make them ill • a circus lion learns to stand on a chair because it receives food each time it does so
Imprinting – newborn animals becoming associated with other organisms, usually the parent, where the connection is built over the **sensitive period** (a few days in **precocial species** such as in chicks and goslings), animals will only follow and learn from objects that look like the imprinted organism	• Lorenz' goslings which followed him around and learned to avoid danger from following him • young birds learning how to swim and fly by following their parents
Insight learning – regarded as the highest form of learning, this involves solving problems with reasoning and thought, and once a problem is solved or an obstacle overcome, the solution is learned and repeated in the future	• Köhler's work with chimpanzees shows that when presented with bananas hung from the ceiling out of reach, the chimps were able to stack some boxes themselves and climb on top of them to reach the bananas
Latent learning (or exploratory learning) – animals learn information about their surroundings which may not be of immediate use but is retained for future reference, which may at one stage be crucial for survival	• young rabbits explore the surroundings of their burrow, learning the feature of their environments, which may help the rabbit survive a predator later on in its lifetime

Classical conditioning

Probably one of the most well-known animal psychology studies was that by Ivan Pavlov into **classical conditioning**. This is building a connection between one stimulus and another, so that the *conditioned stimulus* provokes the same response as the original stimulus. The storyboard below outlines Pavlov's procedure with his dogs:

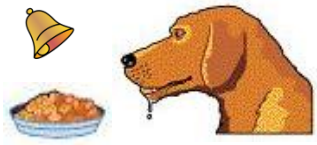


The dog is presented with some food, so the dog salivates

At this stage, the food is an **unconditioned stimulus** (**UCS**), which causes the dog to salivate – this is an **unconditioned response** (**UCR**)

A bell is rung, which causes no response from the dog

The bell is a **neutral stimulus** (**NS**) – it has not been condition with another stimulus, and therefore causes no response within the dog



The bell is rung, and the dog is presented with some food

This causes the dog to salivate, because he is being presented with some food. The bell is still an NS, the food still a UCS and the salivation a UCR

The bell keeps ringing each time food is presented. Eventually, even when the food is not there, the dog will still salivate at the sound of the bell: the bell has become a **conditioned stimulus** (**CS**) and the salivation a **conditioned response** (**CR**)

The fight or flight response

One way in which an animal responds to the environmental stimuli it is presented with is with the **fight or flight response**. When a mammal perceives a potential threat as dangerous, there are a number of physiological changes which take place to prepare the mammal for dealing with the threat: either by confrontation directly or by escaping.

Mammals have complex endocrine and nervous systems, and there is strong coordination of the nervous and hormonal responses to perceived threat. At the heart of the fight or flight response lies the **hypothalamus**, which starts the waves of nervous and hormonal responses. The physiological changes which occur during the stress response include:

- pupils dilate
- increase of heart rate, blood pressure, blood glucose levels and breathing rate
- arterioles to the digestive system and skin are constricted, whilst those to the muscles and liver are dilated (this temporarily shuts down the digestive system so blood can flow to more important areas, which gives the feeling of 'butterflies in the stomach' whenever humans feel nervous
- sweat production increases
- endorphins (natural painkillers) are released into the brain

The detection of the perceived threat may come from either visual or auditory stimuli. The cerebral understanding of the threat stimulates the hypothalamus, which in turn stimulates increased activity in the *sympathetic* system and triggers the release of **adrenaline** into the bloodstream from the *adrenal medulla*.

The hypothalamus also releases **CRF** (corticosteroid-releasing factor) which goes directly to the **pituitary gland** to stimulate the release of another hormone, **ACTH** (adreno-corticotropic hormone). This hormone then stimulates the release of a number of other hormones from the adrenal glands, one effect of which is to help the body resist **stressors** (stimuli which cause the stress response). It is this combined effect of the increases sympathetic nervous activity, and the release of adrenaline and other hormones, which produces the physiological changes of the stress response.